

Chapter 17

Low Cost Immersive VR Solutions for Serious Gaming

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ABSTRACT

Games are used for other purposes than providing entertainment. This chapter is particularly interested in serious games, also known as simulators, with immersive virtual reality environments that are used for training and teaching purposes. These simulators have very stringent requirements and as a result, they are expensive to build. However, the authors managed to develop a ship handling simulator for the Sri Lanka Navy, at a cost of less than \$20,000, which is an order of magnitude less costly than the cheapest available ship handling simulators. The cost of the simulator was kept at a minimum by using Commodity-Off-The-Shelf (COTS) hardware, Free and Open Source Software (FOSS), and also by adopting a development strategy which kept the client involved in the complete life cycle of the development. The availability of the required manpower at a very low cost in Sri Lanka was also beneficial.

INTRODUCTION

Computer based games are usually associated with entertainment. However, there is a particular genre of games called serious games that do not focus on providing entertainment but focuses

on solving real world problems (VSTEP, 2010), (Ilan Papini, 2010). Ship handling simulators, firing simulators, and flight simulators that are used for training are some of the examples of serious games (FlightSafety International Inc, 2010) (Simulator Systems International (SSI), 2010) (Transas Marine Limited, 2010) (Oceanic

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Consulting Corporation, 2008). Although these simulators are not usually referred to as games they use the same technology and design concepts used in games.

Serious games mentioned above have more stringent requirements that are not usually expected of games for entertainment. These games model real world physics, and responses to external events are expected in real time. Therefore, they require higher computational power and high end components, in contrast to games that are purely entertainment. In addition, a higher level of expertise is required to model the real world physics as accurately as possible. Certain serious games such as the ship handling simulators and flight simulators used for training purposes also require the users to be in an immersive virtual reality environment when they interact with the game. This leads to the high cost of some serious games (FlightSafety International Inc, 2010), (Simulator Systems International (SSI), 2010) (Transas Marine Limited, 2010) (Oceanic Consulting Corporation, 2008).

The performance of computer hardware has improved tremendously over the past decade and the cost has also gone down. It is now possible to use commodity-off-the-shelf (COTS) hardware to model real world physics in real time with the accuracy required for serious games. In addition, there are free and open source software (FOSS)

packages that could be used to build physics simulators and rendering engines to create the virtual environments. Accordingly, low cost serious games equal to commercial high end simulators can be developed using off-the-shelf hardware and open source software components.

This chapter focuses on the design challenges in developing immersive virtual reality solutions for serious games using COTS hardware and FOSS. These challenges are more or less common to most serious games and we attempt to keep the discussion generic. The term serious game is very broad; it is not possible to address the design issues related to the broad spectrum of games covered by this term. In this chapter, we limit our focus on serious games used for training in handling vehicles, such as ships, flights, and cars in immersive virtual environments.

To ease the discussion, we use the example of building a ship handling simulator called “*Vidusayura*” to satisfy several training requirements of the Sri Lanka Navy (SL navy) as shown in Figure 1, it was built using the COTS hardware and FOSS were used to develop it.

Sri Lanka Navy

The Sri Lankan Navy (SLN) is the naval arm of the Sri Lankan Armed Forces. They have a training division to train the crew for their ships. One

Figure 1. Vidusayura ship handling simulator



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